

## LOWER ARKANSAS RIVER BASIN TOTAL MAXIMUM DAILY LOAD

**Water Body: Hargis Lake**  
**Water Quality Impairment: Eutrophication**

### 1. INTRODUCTION AND PROBLEM IDENTIFICATION

**Subbasin:** Lower Salt Fork

**Counties:** Barber and Harper

**HUC 8:** 11060004

**HUC 11 (HUC 14): 010 (040)**

**Drainage Area:** Approximately 31.3 square miles. **(Figure 1)**

**Conservation Pool:** Area = 40.4 acres, Maximum Depth = 1 meter

**Designated Uses:** Secondary Contact Recreation; Expected Aquatic Life Support; Food Procurement

**1998 303d Listing:** Table 4 - Water Quality Limited Lakes

**Impaired Use:** All uses are impaired to a degree by eutrophication

**Water Quality Standard:** Nutrients - Narrative: The introduction of plant nutrients into streams, lakes, or wetlands from artificial sources shall be controlled to prevent the accelerated succession or replacement of aquatic biota or the production of undesirable quantities or kinds of aquatic life. (KAR 28-16-28e(c)(2)(B)).

The introduction of plant nutrients into surface waters designated for primary or secondary contact recreational use shall be controlled to prevent the development of objectionable concentrations of algae or algal by-products or nuisance growths of submersed, floating, or emergent aquatic vegetation. (KAR 28-16-28e(c)(7)(A)).

# Hargis Lake TMDL Reference Map

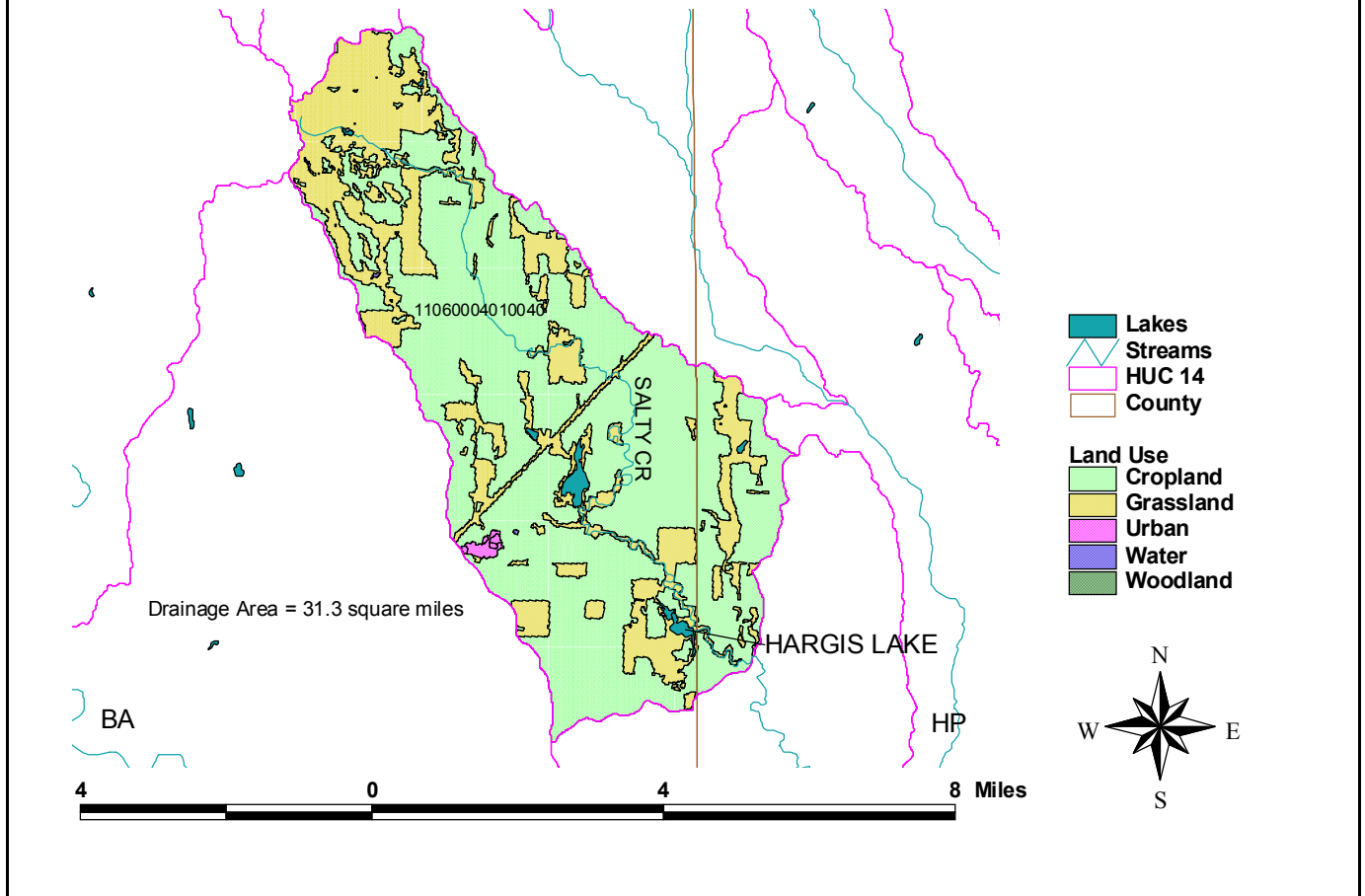


Figure 1

## 2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

**Level of Eutrophication:** Hypereutrophic, Trophic State Index = 72.99

**Monitoring Sites:** Station 063301 in Hargis Lake

**Period of Record Used:** One survey during 1994.

**Current Condition:** The average, total phosphorus concentration was 575 ppb in 1994. The phosphorus samples were taken after a rain; the concentrations may be higher than what would be expected under “normal” conditions. The average chlorophyll a concentration is 75.5 ppb.

The chlorophyll a to phosphorus yield is low. Nitrogen appears to be the primary limiting factor. Light is not limiting, despite high inorganic turbidity.

The Trophic State Index is derived from the chlorophyll a concentration. Trophic state assessments of potential algal productivity were made based on chlorophyll a concentrations, nutrient levels, and values of the Carlson Trophic State Index (TSI). Generally, some degree of eutrophic conditions is seen with chlorophyll a concentrations over 12 ug/l and hypereutrophy occurs at levels over 30 ug/l. The Carlson TSI, derives from the chlorophyll concentrations and scales the trophic state as follows:

1. Oligotrophic	TSI < 40
2. Mesotrophic	TSI: 40 - 49.99
3. Slightly Eutrophic	TSI: 50 - 54.99
4. Fully Eutrophic	TSI: 55 - 59.99
5. Very Eutrophic	TSI: 60 - 63.99
6. Hypereutrophic	TSI: ≥ 64

#### **Interim Endpoints of Water Quality (Implied Load Capacity) at Hargis Lake over 2005 - 2009:**

In order to improve the trophic condition of the lake from its current hypereutrophic status, the desired endpoint will be summer chlorophyll a concentrations at or below 20 ug/l, corresponding to a trophic state of eutrophic conditions by 2009. Refined endpoints will be developed in 2005 to reflect additional sampling and artificial source assessment and confirmation of impaired status of lake.

### **3. SOURCE INVENTORY AND ASSESSMENT**

**Land Use:** The watershed has a very high potential for nonpoint source pollution. An annual phosphorus load of 2,777.8 pounds per year is necessary to correspond to the concentrations seen in the lake. The annual nitrogen load is 16,975 lb/yr.

The primary source of phosphorus within Hargis Lake is runoff from agricultural lands where phosphorus has been applied. Land use coverage analysis indicates that 70.5 % of the watershed is cropland and 28.9 % is grassland. A combined total of 43,873 tons of fertilizer was purchased in Barber and Harper Counties in 1998. Since the watershed accounts for 1.6 percent of the county, then 715 tons of fertilizer were bought and possibly used in the watershed.

Phosphorus from animal waste is a contributing factor. A high density of livestock grazes on the cropland in the winter. A low number of livestock are present in the watershed in the summer.

**Contributing Runoff:** The watershed's average soil permeability is 3.6 inches/hour according to NRCS STATSGO data base. About 56% of the watershed produces runoff even under relative

low (1.5"/hr) potential runoff conditions. Under very low (<1"/hr) potential conditions, this potential contributing area is greatly reduced (11%). Runoff is chiefly generated as infiltration excess with rainfall intensities greater than soil permeabilities. As the watersheds' soil profiles become saturated, excess overland flow is produced. Generally, storms producing less than 0.5"/hr of rain will generate runoff from only 3% of this watershed, chiefly along the stream channels.

**Background Levels:** Nutrient recycling of the sediments (from wind mixing and bottom feeding fish) in the lake is likely contributing available phosphorus to the lake for algal uptake. Geological formations contain small amounts of phosphorus (up to 0.5% of total weight), and may contribute to phosphorus loads.

#### **4. ALLOCATION OF POLLUTANT REDUCTION RESPONSIBILITY**

More detailed assessment of sources and confirmation of the trophic state of the lake must be completed before detailed allocations can be made. The general inventory of sources within the drainage does provide some guidance as to areas of load reduction.

**Point Sources:** A current Wasteload Allocation of zero is established by this TMDL because of the lack of point sources in the watershed. Should future point sources be proposed in the watershed and discharge into the impaired segments, the current wasteload allocation will be revised by adjusting current load allocations to account for the presence and impact of these new point source dischargers.

**Nonpoint Sources:** Water quality violations are predominantly due to nonpoint source pollutants. Background levels may be attributed to nutrient recycling. The assessment suggests that cropland and animal waste throughout the watershed contribute to the trophic state of the lake. Generally a Load Allocation of 750.0 pounds per year, leading to a 70% reduction in phosphorus is necessary to reach the endpoint. The Load Allocation for nitrogen is 7,213 pounds per year, resulting in a 52.8% reduction.

**Defined Margin of Safety:** The margin of safety provides some hedge against the uncertainty of variable annual phosphorus loads and the chlorophyll a endpoint. Therefore, the margin of safety will be 83.3 pounds per year of phosphorus and 801 pounds per year of nitrogen taken from the load capacity to ensure that adequate load reduction occurs to meet the endpoint.

**State Water Plan Implementation Priority:** Because the Hargis Lake is privately owned and a more detailed source assessment and additional in-lake monitoring of nutrient and algal content is needed, this TMDL will be a Low Priority for implementation

**Unified Watershed Assessment Priority Ranking:** This watershed lies within the Lower Salt Fork subbasin (HUC 8: 11060004) with a priority ranking of 41 (Medium Priority for restoration).

**Priority HUC 11s:** The lake is within HUC 11 (010).

## 5. IMPLEMENTATION

### **Desired Implementation Activities**

There is abundant potential within this watershed to reduce nonpoint source pollutant loads. Such load reductions might be able to achieve full use support for this water body for a significant portion of each summer.

### **Implementation Programs Guidance**

Until additional assessment of probable nonpoint sources and in-lake nutrient content is made, no direction can be made to those implementation programs.

**Time Frame for Implementation:** Pollution reduction practices should be installed within the lake drainage during the years from 2009 to 2013.

**Targeted Participants:** Primary participants for implementation will be agricultural producers within the drainage of the lake. A detailed assessment of sources will be conducted by KDHE over 2003-2005.

**Milestone for 2005:** The year 2005 marks the midpoint of the ten-year implementation window for the watershed. At that point in time, sampled data from Hargis Lake will be reexamined to confirm the impaired status of the lake. Should the case of impairment remain, source assessment, allocation and implementation activities will ensue.

**Delivery Agents:** The primary delivery agents for program participation will be the conservation districts for programs of the State Conservation Commission and the Natural Resources Conservation Service. Producer outreach and awareness will be delivered by Kansas State Extension.

### **Reasonable Assurances:**

**Authorities:** The following authorities may be used to direct activities in the watershed to reduce pollutants.

1. K.S.A. 65-171d empowers the Secretary of KDHE to prevent water pollution and to protect the beneficial uses of the waters of the state through required treatment of sewage and established water quality standards and to require permits by persons having a potential to discharge pollutants into the waters of the state.
2. K.S.A. 2-1915 empowers the State Conservation Commission to develop programs to assist the protection, conservation and management of soil and water resources in the state, including riparian areas.
3. K.S.A. 75-5657 empowers the State Conservation Commission to provide financial assistance for local project work plans developed to control nonpoint source pollution.

4. K.S.A. 82a-901, et seq. empowers the Kansas Water Office to develop a state water plan directing the protection and maintenance of surface water quality for the waters of the state.

5. K.S.A. 82a-951 creates the State Water Plan Fund to finance the implementation of the Kansas Water Plan.

6. The Kansas Water Plan and the Lower Arkansas Basin Plan provide the guidance to state agencies to coordinate programs intent on protecting water quality and to target those programs to geographic areas of the state for high priority in implementation.

**Funding:** The State Water Plan Fund annually generates \$16-18 million and is the primary funding mechanism for implementing water quality protection and pollutant reduction activities in the state through the Kansas Water Plan. The state water planning process, overseen by the Kansas Water Office, coordinates and directs programs and funding toward watersheds and water resources of highest priority. Typically, the state allocates at least 50% of the fund to programs supporting water quality protection. This watershed and its TMDL are a Low Priority consideration and should not receive funding until after 2005.

**Effectiveness:** Nutrient control has been proven effective through conservation tillage, contour farming, and use of grass waterways and buffer strips. The key to success will be widespread utilization of conservation farming within the watersheds cited in this TMDL.

## **6. MONITORING**

Additional data, to establish nutrient ratios, source loading and further determine mean summer lake trophic condition, would be of value prior to 2006. Further sampling and evaluation should occur twice before 2006.

## **7. FEEDBACK**

**Public Meetings:** Public meetings to discuss TMDLs in the Lower Arkansas Basin were held March 9 in Wichita, April 26 in Wichita and Hutchinson, and April 27 in Arkansas City and Medicine Lodge. An active Internet Web site was established at <http://www.kdhe.state.ks.us/tmdl/> to convey information to the public on the general establishment of TMDLs and specific TMDLs for the Lower Arkansas Basin.

**Public Hearing:** A Public Hearing on the TMDLs of the Lower Arkansas Basin was held in Wichita on June 1, 2000.

**Basin Advisory Committee:** The Lower Arkansas Basin Advisory Committee met to discuss the TMDLs in the basin on September 27, November 8, 1999; January 13, 2000; March 9, 2000.

**Discussion with Interest Groups:** Meetings to discuss TMDLs with interest groups include:

Agriculture: January 12, February 2 and 29, 2000

Environmental: March 9, 2000

Conservation Districts: November 22, 1999

Industry: December 15, 1999, January 13, February 9 and 22, 2000

Local Environmental Protection Groups: September 30, November 2, December 16, 1999

**Milestone Evaluation:** In 2005, evaluation will be made as to the degree of impairment which has occurred within the drainage and current condition of Hargis Lake. Subsequent decisions will be made regarding implementation approach and follow up of additional implementation.

**Consideration for 303d Delisting:** Hargis Lake will be evaluated for delisting under Section 303d, based on the monitoring data over the period 2005-2009. Therefore, the decision for delisting will come about in the preparation of the 2010 303d list. Should modifications be made to the applicable nutrient criterion during the ten-year implementation period, consideration for delisting, desired endpoints of this TMDL and implementation activities may be adjusted accordingly.

**Incorporation into Continuing Planning Process, Water Quality Management Plan and the Kansas Water Planning Process:** Under the current version of the Continuing Planning Process, the next anticipated revision will come in 2002 which will emphasize revision of the Water Quality Management Plan. At that time, incorporation of this TMDL will be made into both documents. Recommendations of this TMDL will be considered in Kansas Water Plan implementation decisions under the State Water Planning Process after Fiscal Year 2004.

Approved November 13, 2000.